

Integrating Knowledge-Graph-Based EA Smell Detection as a Plug-in into Archi

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Informatics



Knowledge
Graph Lab

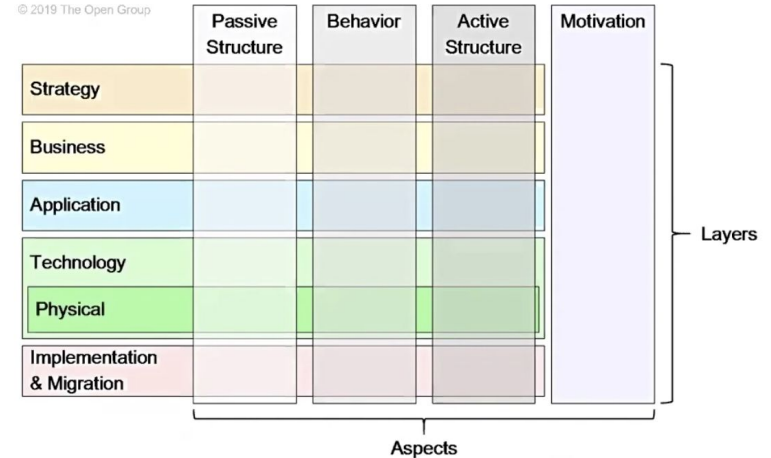


Agenda

- Introduction & Motivation
- Knowledge Graphs for EA Smell Detection
- Archi Plugin
- Demo
- Outlook & Conclusion

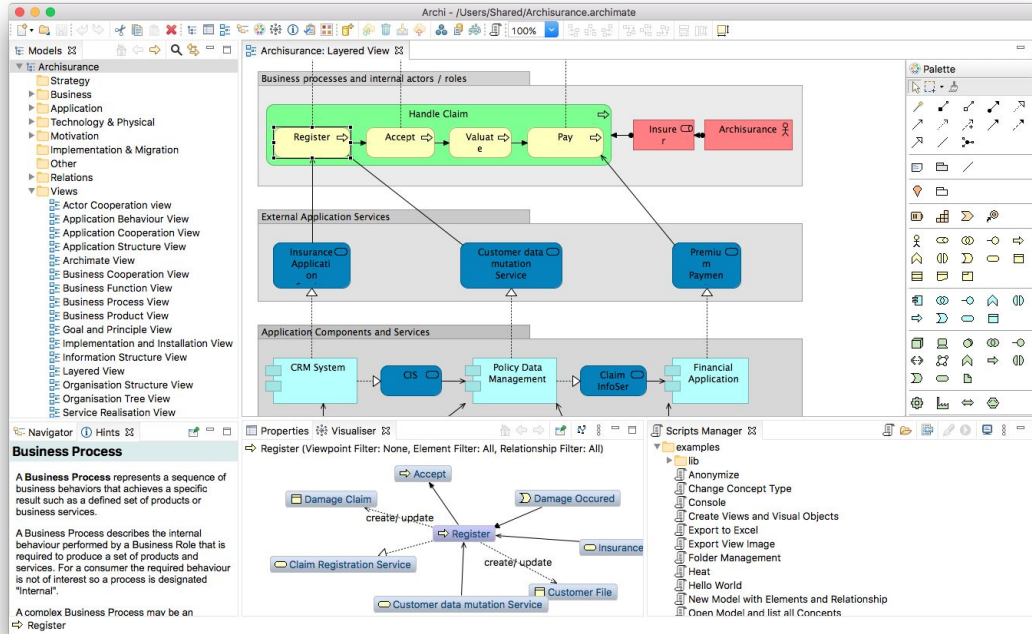
Why Archi?

- **ArchiMate** as a standard for EA modeling
- Model exchange with XML



- **Archi** as the de-facto standard modeling toolkit for ArchiMate
- Free, open-source and cross-platform
- Extensible with a plugin architecture (Eclipse-based)

Archi Modeling Toolkit





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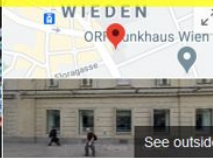

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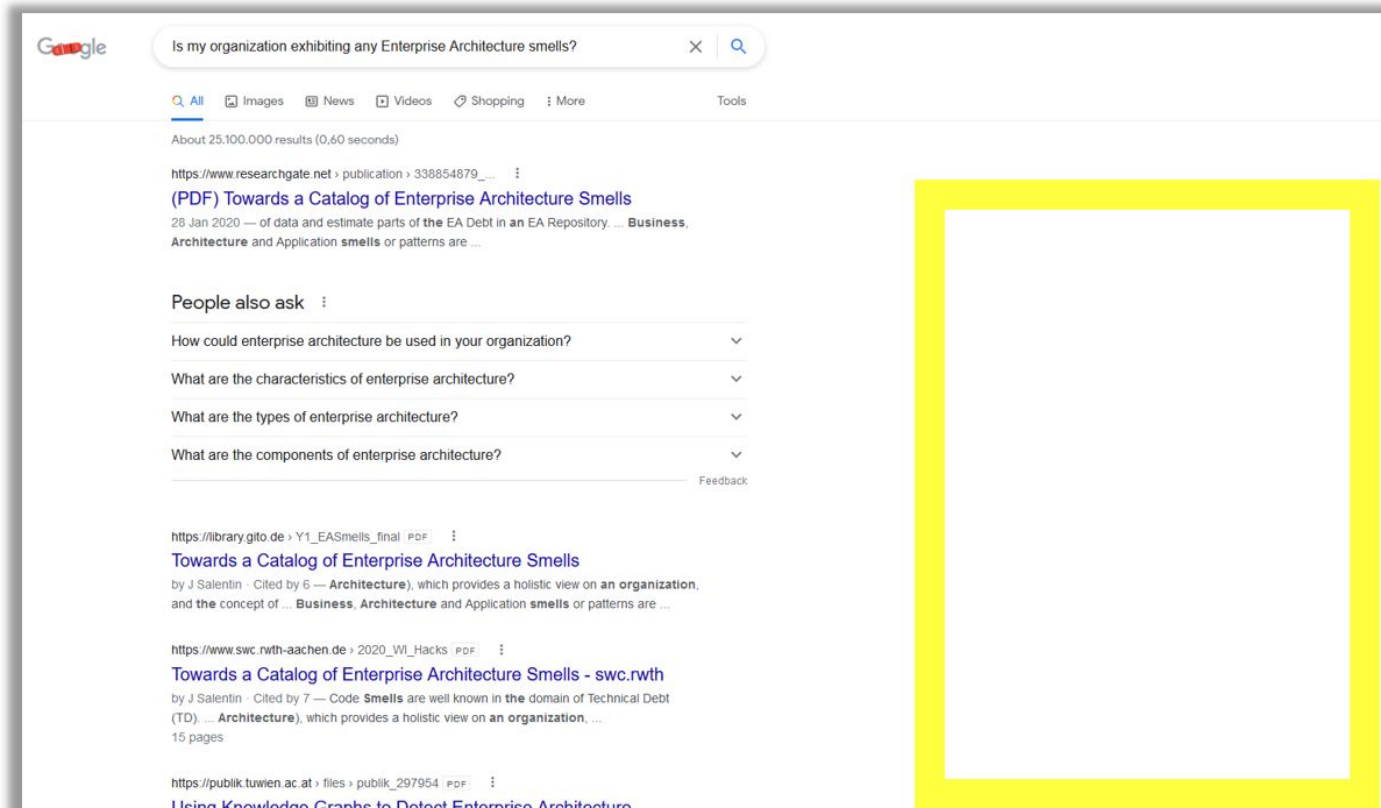
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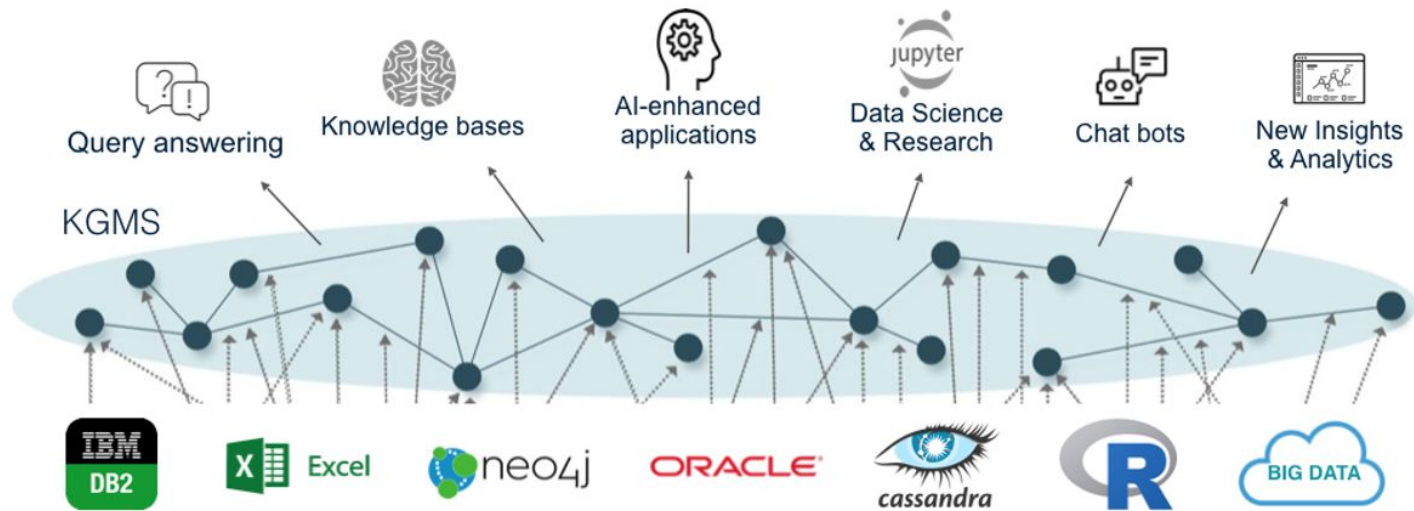
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"Is my organization exhibiting any Enterprise Architecture smells?"







Representations



Graph



Knowledge Graph
Data Models



Knowledge



Knowledge Graph
Embeddings



Logical
Knowledge



Graph Neural
Networks



Representations



Graph



Knowledge



Knowledge Graph
Embeddings



Knowledge Graph
Data Models



Logical
Knowledge



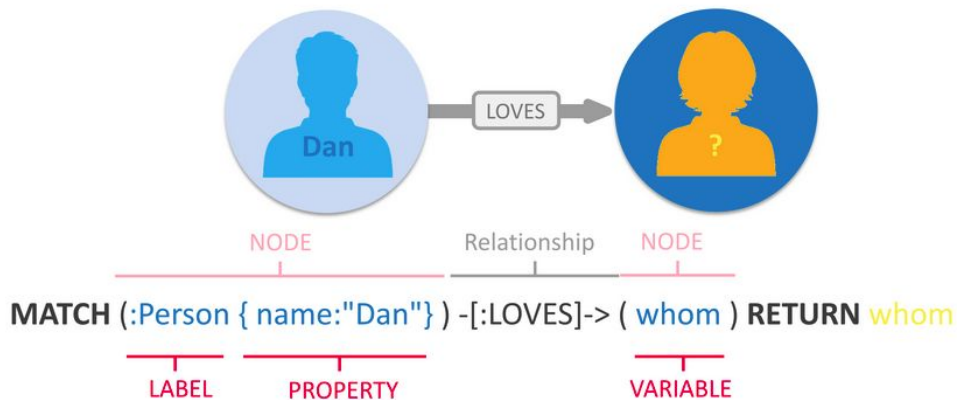
Graph Neural
Networks

Graph Database

EA Smells

neo4j

- World's leading **Graph Database** platform
- Available as a standalone server or embeddable
- Numerous tools, integrations and connectors available for developers
- Powerful **Cypher Query Language**



Knowledge Graphs for EA Smell Detection

Procedure:

1. Import Archi model into neo4j (e.g. CSV, XML, graphML)
-> Transformation required
2. Define Cypher Queries for corresponding EA Smells
3. Run Cypher Queries on the model stored in the neo4j database
4. Visualize the detected EA Smells

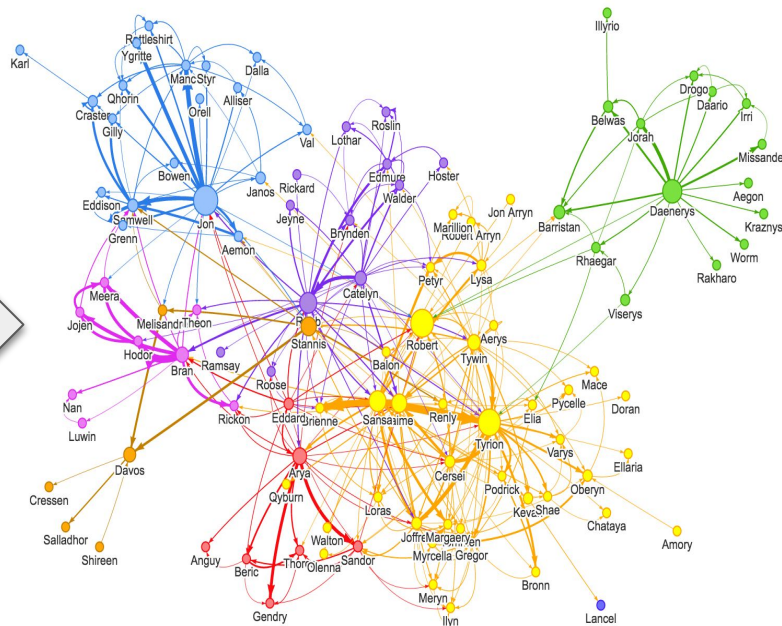
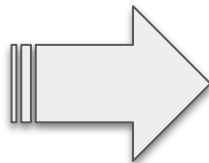
neovis.js Graph Visualization

```
<script src="https://cdn.neo4jlabs.com/neovis.js/v1.5.0/neovis.js"></script>
```

```
<body onload="draw()">
  <div id="viz"></div>
</body>

<script>
  function draw() {
    var config = {
      container_id: "viz",
      server_url: "bolt://localhost:7687",
      server_user: "neo4j",
      server_password: "sorts-swims-burglaries",
      labels: {
        "Character": {
          "caption": "name",
          "size": "pagerank",
          "community": "community",
          "title_properties": [
            "name",
            "pagerank"
          ]
        }
      },
      relationships: {
        "INTERACTS": {
          "thickness": "weight",
          "caption": false
        }
      },
      initial_cypher: "MATCH (n)-[r:INTERACTS]->(m) RETURN *"
    };

    viz = new NeoVis.default(config);
    viz.render();
  }
</script>
```



KGAnalysis Archi Plugin

- **KGAnalysis Plugin**
 - Transformation of Archi models to a Knowledge Graph
 - Visualization of the Knowledge Graph
 - EA Smell Detection using the Knowledge Graph
 - Available as a Plugin for Archi
- Target Audience: EA Architects
 - No graph database knowledge required to use the tool!



Components

Menubar
Toolbar

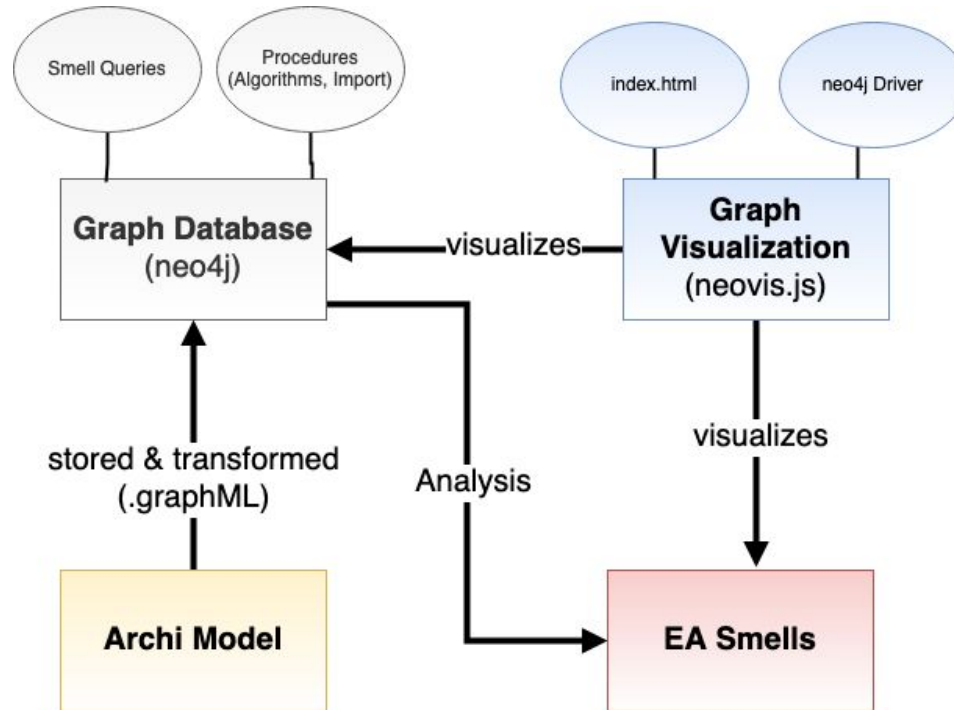
The screenshot displays the Archi software interface. At the top is a standard macOS-style menubar with options: Archi, File, Edit, Tools, Knowledge Graph, Window, and Help. Below the menubar is a toolbar containing various icons for file operations, editing, and graph management. On the left side, there is a 'Models' tree view showing a hierarchical structure of domain events, including categories like Strategy, Business, Application, and Views. The central workspace features a 'Knowledge Graph' visualization, which is a network of blue nodes connected by lines. A tooltip is visible over one of the nodes, displaying details such as 'score: 1', 'Label: Register (callback)', 'ClassName: ApplicationFunction', 'ApplicationFunction_documentation: community: L24', and 'ApplicationFunction_name: Register (callback)'. On the right side, there is a panel for 'Custom Queries' and 'Smell Detection'. It includes a 'Cypher query:' input field with a sample query: `MATCH (n)-[r]->(m) RETURN *`, and buttons for 'Submit', 'Get All', and 'Stabilize'. Below this, there are 'EA Smells' buttons: 'Detect all EA Smells', 'Cyclic Dependency', and 'Dead Component'. Further down, there are 'Graph Algorithms' buttons: 'Louvain (Community)' and 'Degree'. At the bottom of the interface, there is a tabbed area with 'Properties', 'Visualiser', 'Validator', and 'EA Smells' selected. The 'EA Smells' tab shows a table with columns for 'EA Smell', 'Description', and 'Object'. The table is currently empty.

Custom Queries
Smell Detection
Graph Algorithms

Knowledge Graph
Visualization

EA Smells

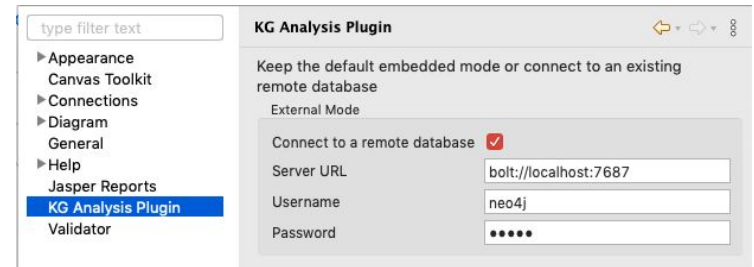
High level Architecture



Demo

Outlook

- Improve Graph Visualization
 - Size, Color, Labels
- Transformation of current Archi model
- Option to use existing neo4j instance
- Import Smell Catalogue
- Show detected smells in Archi Model



Thank you!

Questions? Suggestions?